CLAIMS

Sub A1

1. A device for manipulating microwave radiation, comprising:

a substrate that defines the shape of a surface for reflecting microwave radiation; and

a metal fitting conforming to the defined shape, and providing the surface that reflects microwave radiation.

2. The device of claim 1 wherein the surface defines at least a portion of a microwave resonant cavity.

3. The device of claim 1, wherein the metal fitting has a thickness of greater than 10 μm.

4. The device of claim 1 wherein the surface defines at least a portion of a microwave reflector.

5. The device of claim 1 wherein the substrate comprises an insulator.

6. The device of claim 1 wherein the thickness of the metal fitting is less than 500μm.

7. The device of claim 5 wherein the thickness of the metal fitting is less than 100μm.

8. The device of claim 1 wherein the substrate has a coefficient of thermal expansion less than $5 \times 10^{-6}/^{\circ}C$.

9. The device of claim 1 wherein the metal fitting has a coefficient of thermal expansion greater than $10 \times 10^{-6}/^{\circ}C$.

10. The device of claim 1 further comprising a braze joint that bonds the metal fitting to the substrate.

11. The device of claim 1 wherein the metal fitting comprises silver.

12. The device of claim 1 wherein the metal fitting

comprises a wrought metal.

13. The device of claim 1 wherein the metal fitting consists of a metal that is at least 99% pure.

14. The device of claim 1 wherein the metal fitting is bonded to the substrate via an interference fit.

15. The device of claim 1 wherein the metal fitting has a machined surface.

16. The device of claim 1 wherein the metal fitting completely shields the substrate from exposure to the microwave radiation.

17. The device of claim 1 further comprising an adhesive layer between the substrate and the metal fitting.

18. The device of claim 17, wherein the adhesive layer has a thickness of less than 1.0 μm.

19. The device of claim 1, wherein the metal fitting has a ring shape having an inner diameter and an outer diameter.

20. The device of claim 19, wherein the inner diameter is machined to match an outer diameter of the substrate.

21. The device of claim 19, wherein the outer diameter is machined to match an inner diameter of the substrate.

22. The device of claim 1, wherein the substrate and the metal fitting have a compatible thermal behavior.

23. A method for making a device for manipulating microwave radiation, comprising:

providing a substrate that defines a shape of a surface for reflecting microwave radiation;

providing a metal fitting having a sufficient thickness to provide mechanical stability; and

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bonding the metal fitting to the substrate, the metal fitting providing the surface that reflects microwave radiation.

24. The method of claim 23, further comprising thinning the metal fitting to provide the surface after bonding the metal fitting.

25. The method of claim 24, wherein thinning the metal fitting comprises machining the metal fitting.

26. The method of claim 23, wherein providing the metal fitting comprises machining the metal fitting prior to bonding the metal fitting to the substrate.

27. The method of claim 23 wherein the metal fitting has a thickness of greater than 500μm.

28. The method of claim 23, wherein providing the metal fitting comprises casting and deforming the metal fitting.

29. The method of claim 23, wherein bonding comprises: providing a brazing layer between the metal fitting and the substrate; and heating the brazing layer to a brazing temperature.

30. The method of claim 23, wherein bonding comprises providing an epoxy layer between the substrate and the metal fitting.

31. The method of claim 23, wherein bonding comprises providing a compression fit.

32. The method of claim 31, wherein bonding further comprises: cooling the metal fitting; placing the metal fitting adjacent to the substrate; and causing the metal fitting to warm to an original temperature.

33. The method of claim 31, wherein bonding further

comprises: heating the substrate; placing the metal fitting adjacent to the substrate; and causing the metal fitting to cool to an original temperature.

34. The method of claim 23, wherein bonding comprises: packing an elastomer against the metal fitting; and applying a pressure to the elastomer to cause the metal fitting to deform.

35. The method of claim 34, wherein bonding further comprises disposing an adhesive layer between the metal fitting and the substrate, the adhesive layer having a thickness of less than 1.0 μm after applying the pressure to the elastomer.

36. The method of claim 23 wherein the metal fitting has a circular shape having an inner diameter that matches an outer diameter of the substrate to a radial tolerance sufficient to provide a stable fit between the metal fitting and the substrate.

37. The method of claim 36 wherein bonding comprises providing friction between the metal fitting and the substrate to assist the stable fit.

38. The method of claim 36 wherein bonding comprises providing an adhesive between the metal fitting and the substrate to assist the stable fit.

39. The method of claim 23 wherein the substrate comprises an insulator.